CHAPTER 1

CONSTRUCTION SUPPORT

As a Construction Electrician you will be involved in many aspects of construction work. This chapter touches on a few of these, such as rigging and hoisting, equipment movement, hazardous material, embarkation, and tool kits. Although this chapter does not deal with electrical work, you need to study and refer back to this chapter for your safety and the safety of your shipmates.

USING LINES AND SLINGS

The safety of personnel involved in rigging and hoisting operations largely depends upon care and common sense. Equally important is the proper selection of lines and slings for safe and stable lifts.

INSPECTIONS

The single most important operational check to be made on hoisting and rigging equipment is the line and rigging inspection. Such factors as abrasion, wear, fatigue, corrosion, and kinking are of great significance in determining usable life.

The only way to determine the safety of a line, its life expectancy, and its load-carrying ability is by regularly inspecting every foot of its length. The main points to watch for are external wear and cutting, internal wear between the strands, and deterioration of the fibers.

FIBER LINES

Fiber lines are made from either natural or synthetic fibers. The natural fibers come from plants and include manila, sisal, and hemp. The synthetic fibers include nylon, polypropylene, and the polyesters. The strength of these lines depends on their size, the fiber used, and the type of stranding.

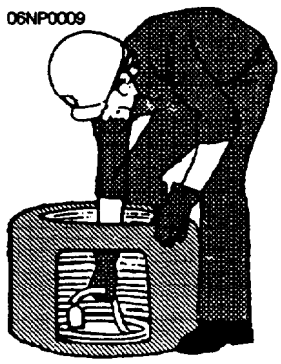


Figure 1-1.—Removing line from a shipping coil.

Uncoiling Line

New line is coiled, bound, and wrapped. The protective covering should not be removed until the line is to be used. This covering will protect the line during stowage and prevent tangling. To open, strip off the outer wrapping and look inside the coil for the end of the line. This should be at the bottom of the coil. If not, turn the coil over so that the end will be at the bottom, as shown in figure 1-1. Pull the end of the line up through the center of the coil. As the line comes up through the coil, it will unwind in a counterclockwise direction.

Whipping Line

The term *whipping* refers to the process of securing the ends of a line to prevent the strands from unraveling and the yarns from separating or fraying. Whippings are made from fine twine and will not increase the size of the line enough to prevent it from fitting the blocks or openings.

Figure 1-2 shows the steps to follow in applying a whipping. Make a loop in the end of the twine and place

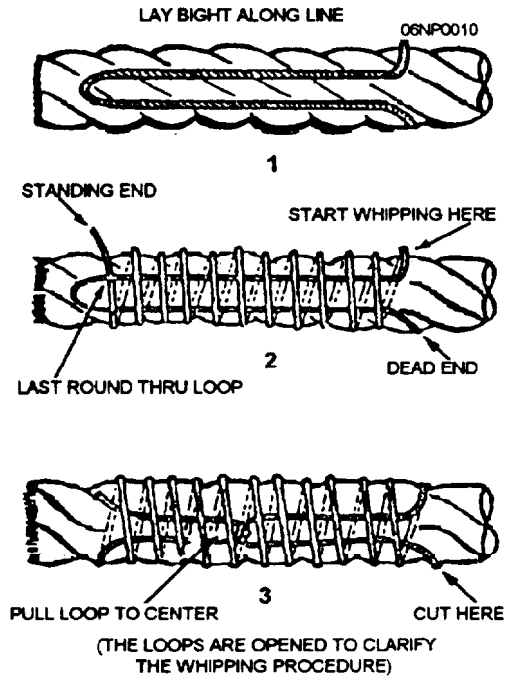


Figure 1-2.—Proper way to apply a line whipping.

the loop at the end of the line, as shown in the figure. Wind the standing part around the line covering the loop of the whipping. Leave a small loop uncovered, as shown. Pass the remainder of the standing end up through the small loop and pull the dead end of the twine, thus pulling the small loop and the standing end back towards the end of the line underneath the whipping. Pull the dead end of the twine until the loop with the standing end reaches a point midway underneath the whipping. Trim both ends of the twine close up against the loops of the whipping. Before cutting a line, place two whippings on the line 1 or 2 inches apart and make the cut between the whippings. This will prevent the ends from unraveling after they are cut.

Stowing Line

Before stowing a fiber line, you must take certain precautions to safeguard the line against deterioration. You should never stow a wet line. Always dry the line well before placing it in stowage.

After a line has been used, you should coil it down in a clockwise direction (assuming it is a right-hand lay). Should the line be kinked from excessive turns, remove the kinks by the procedure known as "thorough footing." You do this by coiling the line down counterclockwise and then pulling the bottom end of the coil up and out the middle of the coil. If the line is free of kinks as it leaves the coil, make it up in the correct manner. If it is still kinked, repeat the process before making up the line for stowage.

Choose your stowage space for line carefully. Line deteriorates rapidly if exposed to prolonged dampness. Furthermore, it is important for the stowage area to be dry, unheated, and well ventilated. To permit proper air circulation, you should either place the line in loose coils on a wood grating platform about 6 inches (15 cm) above the floor or hang the line in loose coils on a wooden peg.

You should NEVER expose a line to lime, acids, or other chemicals, or even stow it in a room containing chemicals. Even the vapors may severely damage line. As a final precaution, avoid continually exposing line to sunlight. Excessive sunlight will also damage the line.

Strength of Fiber Line

Overloading a line poses a serious threat to the safety of personnel, not to mention the heavy losses likely to result through damage to material. To avoid overloading, you must know the strength of the line you are working with. This involves three factors: breaking strength, safe working load, and safety factor.

BREAKING STRENGTH.—Refers to the tension at which the line will part when a load is applied. Line manufacturers have determined breaking strength through tests and have set up tables to provide this information

SAFE WORKING LOAD—Briefly defined, the "safe working load" (SWL) of a line is the load that can be applied without causing any kind of damage to the line. Note that the safe working load is considerably less than the breaking strength. A wide margin of difference between breaking strength and safe working load is necessary to allow for such factors as additional strain imposed on the line by jerky movements in hoisting or bending over sheaves in a pulley block.

SAFETY FACTOR.— safety factor of a line is the ratio between the breaking strength and the safe working load. Usually, a safety factor of 4 is acceptable, but this is not always the case. In other words, the safety factor will vary, depending on such things as the condition of the line and circumstances *under* which it is to be used. While the safety factor should NEVER be less than 3, it often should be well above 4 (possibly as high as 8 or 10). For best, average, or unfavorable conditions, the safety factor indicated below may often be suitable.

BEST conditions (new line): 4

AVERAGE conditions (line used but in good condition): 6

UNFAVORABLE conditions (frequently used line, such as running rigging): 8

Table 1-1 lists some of the properties of manila and sisal line, including strength. The table shows that the minimum breaking strength is considerably greater than the safe working capacity. The difference is caused by the application of a safety factor. The safe working load (SWL) of line is obtained by dividing the breaking strength (BS) by a factor of safety (FS). A new 1-inch-diameter No. 1 manila line has a breaking strength of 9,000 pounds, as indicated in table l-l. To determine the safe working load of the line, you would divide its breaking strength by a minimum standard safety factor

of 4. The result is an SWL of 2,250 pounds. A safety factor is always used because the breaking strength of line be comes reduced after use and exposure to weather conditions. In addition, a safety factor is required because of shock loading, knots, sharp bends, and other stresses that the line may encounter during its use.

If tables are not available, the SWL may be closely approximated by a rule of thumb. The rule of thumb for the SWL, in tons, for fiber line is equal to the square of the line diameter in inches (SWL = D^2). The SWL, in tons, of a 1/2-inch-diameter fiber line would be 1/2 inch squared or 1/4 ton. The rule of thumb allows a safety factor of approximately 4.

SYNTHETIC-FIBER LINES

Synthetic-fiber lines, such as nylon and polyester, have rapidly gamed wide use by the Navy. They are lighter in weight, more flexible, less bulky, and easier to handle and stow than manila lines. Also, they are highly resistant to mildew, rot, and fungus. Synthetic lines are stronger than natural-fiber line; for example, nylon is about three times stronger than manila. When nylon line is wet or frozen, the loss of strength is relatively small. Nylon line will hold a load, even though several strands may be frayed. Ordinarily, the line can be made reusable by cutting away the chafed or frayed section and splicing the good line together.

Table 1-1.—Properties of Manila and Sisal Line

Nominal diameter (inches)	Circum-ference (inches)	Lb per ft	No. 1 Manila		Sisal	
			Breaking strength (pounds)	Safe load (pounds) F.S. = 4	Breaking strength (pounds)	Safe load (pounds) F.S. = 4
1/4	3/4	.020	600	150	480	120
3/8	1 1/8	.040	1,350	325	1,080	260
1/2	1 1/2	.075	2,650	660	2,120	520
5/8	2	.133	4,400	1,100	3,520	880
3/4	2 1/4	.167	5,400	1,350	4,320	1,080
7/8	2 3/4	.186	7,700	1,920	6,160	1,540
1	3	.270	9,000	2,250	7,200	1,800
1 1/8	3 1/2	.360	12,000	3,000	9,600	2,400
1 1/4	3 3/4	.418	13,500	3,380	10,800	2,700
1 1/2	4 1/2	.600	18,500	4,620	14,800	3,700
1 3/4	5 1/2	.895	26,500	6,625	21,200	5,300
2	6	1.08	31,000	7,750	24,800	6,200
2 1/2	7 1/2	1.35	46,500	11,620	37,200	9,300
3	9	2.42	64,000	16,000	51,200	12,800

Tables 1-2 and 1-3 list the approximate safe working loads of new fiber lines with a safety factor of 5.

NOTE: These are for reference only. Check the manufacturer's ratings before determining the safe working loads, as they may differ from the tables.

You may not always have a chart available to tell you the safe working load for a particular size of line. There is a rule of thumb that will adequately serve your needs on such an occasion. The formulas below are examples of synthetic fiber lines used for rigging, not slings.

For **nylon** or **polyester** line, change the line diameter into eighths of an inch, square the numerator, and multiply by 60.

Example: 1/2-inch nylon line = 4/8-inch diameter

SWL = 4 x 4 x 60 = 960 lb

For polypropylene line, multiply the diameter by 40, and for polyethylene, by 35.

Remember that the strength of a line decreases with age, use, and exposure to excessive heat, boiling water, or sharp bends. Especially with used line, you should give these and other factors affecting strength careful consideration and make proper adjustment in the breaking strength and SWL of the line.

WIRE ROPE

During the course of a career, CEs often need to hoist or move heavy objects. Wire rope is used for heavy-duty work. In the following paragraphs, we will discuss the characteristics, construction, and usage of many types of wire rope as well as the safe working load, use of attachments and fittings, and procedures for the care and handling of wire rope.

Table 1-2.—Safe Working Load of Fiber Line

APPROXIMATE SAFE WORKING LOADS OF NEW FIBER LINES — POUNDS Three-Strand Line Safety Factor = 5					
Nominal Line Diameter (inches)	Manila	Nylon	Polypropylene	Polyester	Polyethylene
3/16	100	200	150	200	150
1/4	120	300	250	300	250
5/16	200	500	400	500	350
3/8	270	700	500	700	500
1/2	530	1,250	830	1,200	800
5/8	880	2,000	1,300	1,900	1,050
3/4	1,080	2,800	1,700	2,400	1,500
7/8	1,540	3,800	2,200	3,400	2,100
1	1,800	4,800	2,900	4,200	2,500
1 1/8	2,400	6,300	3,750	5,600	3,300
1 1/4	2,700	7,200	4,200	6,300	3,700
1 1/2	3,700	10,200	6,000	8,900	5,300
1 5/8	4,500	12,400	7,300	10,800	6,500
1 3/4	5,300	15,000	8,700	12,900	7,900
2	6,200	17,900	10,400	15,200	9,500

Table 1-3.—Safe Working Load of Braided Synthetic Fiber Line

APPROXIMATE SAFE WORKING LOADS OF NEW BRAIDED SYNTHETIC FIBER LINES (LB) SAFETY FACTOR = 5			
Nominal Line Diameter (inches)	Nylon Cover Nylon Core	Nylon Cover Polypropylene Core	Polyester Cover Polypropylene Core
1/4	420	—	380
5/16	640	—	540
3/8	880	680	740
7/16	1,200	1,000	1,060
1/2	1,500	1,480	1,380
9/16	2,100	1,720	—
5/8	2,400	2,100	2,400
3/4	3,500	3,200	2,860
7/8	4,800	4,150	3,800
1	5,700	4,800	5,600
1 1/8	8,000	7,000	—
1 1/14	8,800	8,000	—
1 1/2	12,800	12,400	—
1 5/8	16,000	14,000	—
1 3/4	19,400	18,000	—
2	23,600	20,000	—

Construction

Wiie rope consists of three parts: wires, strands, and core (fig. 1-3). In the manufacture of wire rope, a number of WIRES are laid together to form the STRAND. Then a number of STRANDS are laid together around a CORE to form the wire ROPE.

The basic unit of wire-rope construction is the individual wire, which may be made of steel, iron, or other metal in various sixes. The number of wires to a strand will vary, dependingonthepurpose for which the wire rope is intended. Wiie rope is designated by the number of strands per rope and the number of wires per strand. Thus a 1/2-inch, 6 by 19 wire rope will have six strands with 19 wires per strand; but it will have the same outside diameter as a 1/2-inch, 6 by 37 wire rope, which will have six strands with 37 wires of much smaller size per strand.

Wire rope that is made up of a large number of small wires is flexible. The small wires are, however, easily broken, so the wire rope does not resist external abrasion. Wire rope that is made up of a smaller number

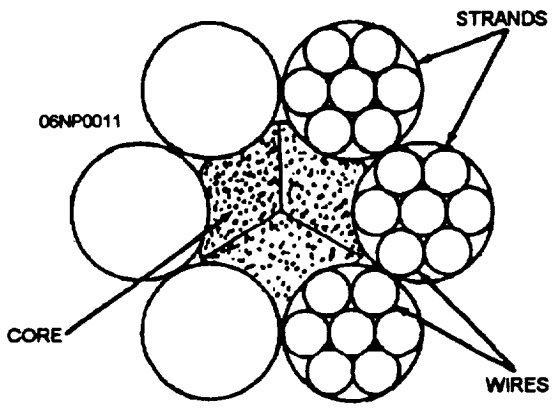


Figure 1-3.—Parts of a wire rope.

of larger wires is more resistant to external abrasion but is less flexible.

The CORE, the element around which the strands are laid to form the wire rope, may be of hard fiber, such as manila, hemp, plastic, paper, or sisal. Also, a wire-strand core may be used. Each type of core serves the same basic purpose—to support the strands laid around it.

A FIBER CORE offers the advantage of increased flexibility. Also, it serves as a cushion to reduce the effects of sudden strain and acts as a reservoir for the oil to lubricate the wires and strands to reduce friction between them. Wire rope with a fiber core is used in places where flexibility of the wire rope is important.

A WIRE-STRAND CORE not only resists heat better than a fiber core but it also adds about 15 percent to the strength of the wire rope. On the other hand, the wire strand makes the wire rope less flexible than a fiber core would.

An INDEPENDENT WIRE-ROPE CORE is a separate wire rope over which the main strands of the wire rope are laid. It usually consists of six seven-wire strands laid around either a fiber core or a wire-strand core. This core strengthens the wire rope more, provides support against crushing, and supplies maximum resistance to heat.

Wire rope may be made by either of two methods. If the strands or wires are shaped to conform to the curvature of the finished wire rope before laying up, the *wire* rope is termed *preformed.* If they are not shaped before fabrication, the wire rope is termed *nonpreformed.* When cut, preformed wire rope tends not to unlay, and it is more flexible than nonpreformed wire rope. With nonpreformed wire rope, twisting produces a stress in the wires; and, when it is cut or broken, the stress causes the strands to unlay. In nonpreformed wire rope, unlaying is rapid and almost instantaneous, which could cause serious injury to someone not familiar with it.

The main types of wire rope used by the Navy have 6, 7, 12, 19, 24, or 37 wires in each strand. Usually, the wire rope has six strands laid around a fiber or steel center.

Two common types of wire rope, 6 by 19 and 6 by 37 wire rope, are shown in figure 1-4. The 6 by 19 type of wire rope, having six strands with 19 wires in each strand, is commonly used for rough hoisting and skidding work where abrasion is likely to occur. The 6 by 37 wire rope, having six strands with 37 wires in each strand, is the most flexible of the standard six-strand wire ropes. For that reason, it is particularly suitable when you are going to use small sheaves and drums, such as are used on cranes and similar machinery.

Grades of Wire Rope

Wire rope is made in a number of different grades, three of which are mild-plow steel, plow steel, and improved-plow steel.

MILD-PLOW STEEL wire rope is tough and pliable. It can stand up under repeated strain and stress, and it has a tensile strength of 200,000 to 220,000 pounds per square inch (psi).

PLOW STEEL wire rope is unusually tough and strong. This steel has a tensile strength (resistance to lengthwise stress) of 220,000 to 240,000 psi. This wire rope is suitable for hauling, hoisting, and logging.

IMPROVED-PLOW STEEL wire rope is one of the best grades of wire rope available, and most, if not all, of the wire rope you will use in your work will probably be made of this material. It is stronger, tougher, and more resistant to wear than either plow steel or mild-plow steel. Each square inch of improved-plow steel can stand a strain of 240,000 to 260,000 psi.

Measuring Wire Rope

The size of wire rope is designated by its diameter. The true diameter of a wire rope is considered as being the diameter of the circle that will just enclose all of its strands. Both the correct and incorrect methods of measuring wire rope are shown in figure 1-5. Note, in particular, that the CORRECT WAY is to measure from the top of one strand to the top of the strand directly opposite it. Use calipers to take the measurement; if calipers are not available, an adjustable wrench will do.

To ensure an accurate measurement of the diameter of a wire rope, always measure the wire rope at three

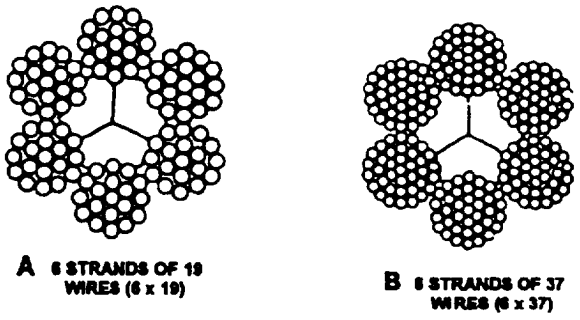


Figure 1-4.—Two types of wire rope.

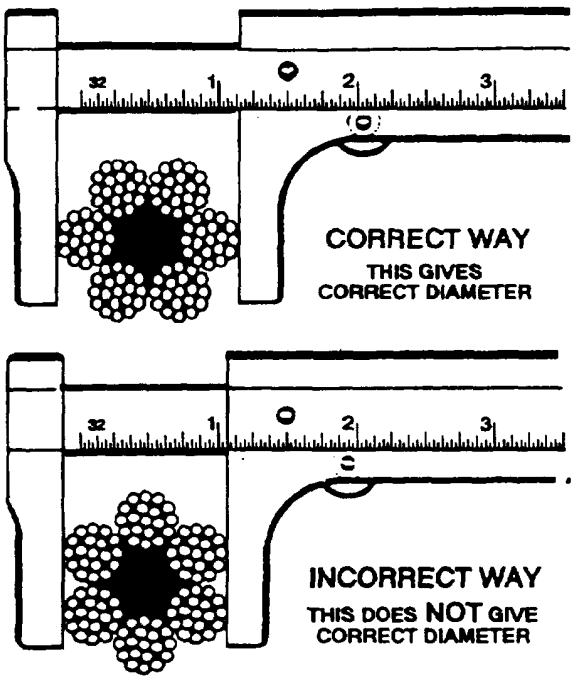


Figure 1-5.—Correct and incorrect methods of measuring wire rope.

places on a six-stranded, and four places on an eight-stranded wire rope. Use the average of the three measurements as the diameter of the wire rope.

Safe Working Load

The term *safe working load* (SWL), as used in reference to wire rope, means the load that you can apply and still obtain the most efficient service and also prolong the life of the wire rope. Most manufacturers provide tables that show the safe working load for their wire rope under various conditions. In the absence of these tables, you may apply the following rule-of-thumb formula to obtain the SWL:

$$SWL \text{ (in tons)} = D^2 \times 8$$

This particular formula provides an ample margin of safety to account for such variables as the number, size, and location of sheaves and drums on which the wire rope runs and such dynamic stresses as the speed of operation and the acceleration and deceleration of the load, all of which can affect the endurance and breaking strength of the wire rope. Remember this formula is a **general computation,** and you should also consider the overall condition of the wire rope.

In the above formula, D represents the diameter of the rope in inches. Suppose you want to find the SWL of a 1/2-inch-diameter wire rope. Using the formula above, you would solve the problem as follows:

$$SWL = (1/2)^2 \times 8$$

$$SWL = 2 \text{ tons}$$

WIRE-ROPE ATTACHMENTS

Wire rope can be attached to other wire ropes, chains, pad eyes, or equipment by splicing, which is permanent, or by any of a number of wire-rope attachments. These include sockets and wire-rope clips. In general, these attachments permit the wire rope to be used with greater flexibility than would be possible with a more permanent splice. The attachments allow the same wire rope to be made up in a variety of different arrangements.

Clips

A temporary eye splice may be put in wire rope by using clips. A single clip (fig. 1-6) consists of three parts: U-bolt, saddle, and nuts. The correct and incorrect methods of applying these clips to wire rope are shown in figure 1-6; the second incorrect method shown is the most common. Notice that the correct way is to apply the clips so that the U-bolts bear against the bitter end; that is, the short end of the wire rope. If the clips are attached incorrectly, the result will be distortion or mashed spots on the live end of the wire rope. After a wire rope is under strain, tighten the clips again. On operating wire ropes, tighten the clips daily and inspect the wire ropes carefully at points where

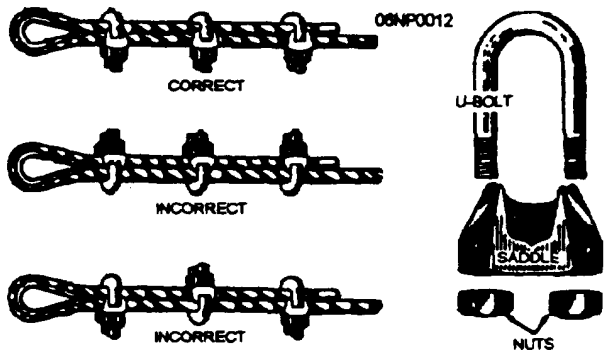


Figure 1-6.—Use of wire-rope clips.

there are clips. Pay particular attention to the wire at the clip farthest from the eye, as vibration and whipping are heaviest here and fatigue breaks are likely to occur.

To obtain maximum strength in the temporary eye splice, use the correct size and number of wire clips. The size is stamped on the saddle between the two holes. A rule of thumb for determining the number of clips required for various sizes of wire rope is to multiply the diameter of the wire rope by 3 and add 1. Stated as a formula, this means

3D + 1 = number of clips.

For example, if the wire rope has a diameter of 1 inch, determine the number of clips as follows:

(3 x 1) + 1 = 4 clips

In case the answer contains a fraction, then use the next largest whole number. For example, suppose you want to find the number of clips for a wire rope 1/2 inch in diameter. Using the formula, the answer would be 2 1/2 clips. You simply use the next whole number to get the correct answer.

You should space the clips properly to provide a good hold on the wire rope. You can determine the correct distance between the clips by multiplying 6 times the diameter of the wire rope. Where D is equal to

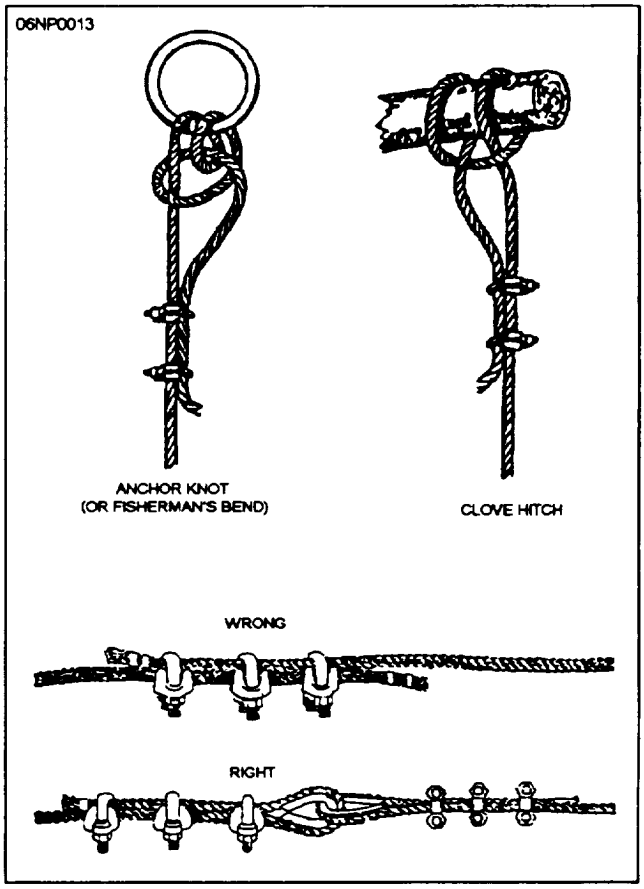


Figure 1-7.—Wire-rope bends and couplings.

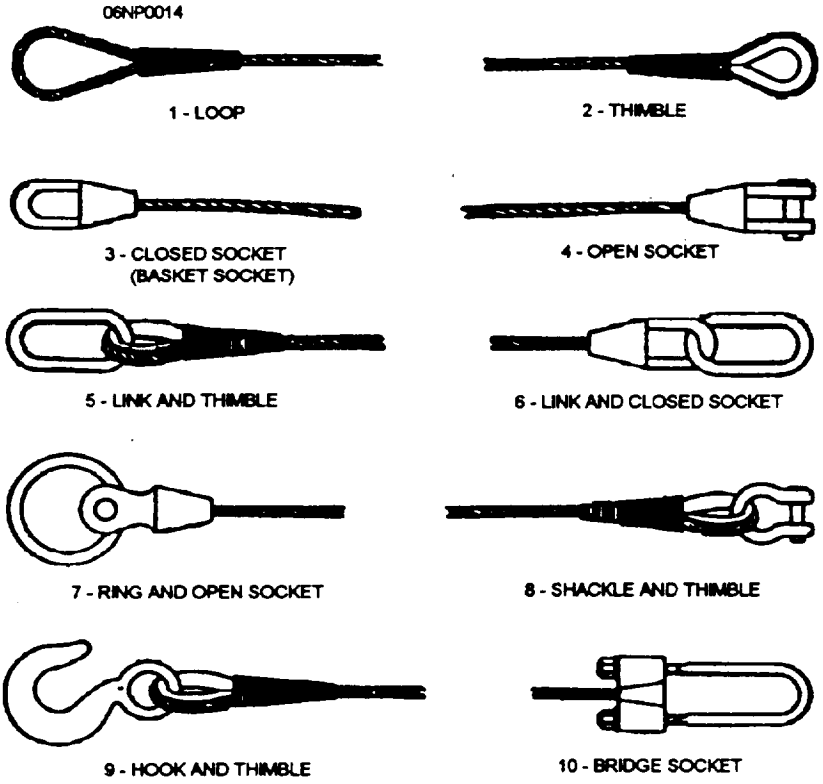


Figure 1-8.—Wire-rope fittings.

the diameter, 6 x D = DISTANCE BETWEEN CLIPS. Here, as in determining the number of clips, if the answer contains a fraction, use the next whole number.

You should inspect and tighten wire-rope clips at regular intervals. Also, after comparatively long use, remove the clips and examine the wire rope for broken wires. If any are present, remove the damaged part and make a new attachment.

Knots

Although wire-rope fittings are stronger and safer and make wire rope last longer, you may have to use knots in emergencies. Use knots secured with clips (fig. 1-7). Figure 1-7 also shows the proper way to join two wire ropes.

Fittings

fittings are attached to the ends of wire rope so that the wire rope can be easily connected to other wire ropes, chains, pad eyes, or heavy equipment. Figure 1-8 shows some standard fittings. The type of fitting used depends on the job. For instance, to hoist a bundle of conduit from ground level, use two wire rope slings made using a thimble in the wire rope and then attaching a shackle to the thimble. A thimble in an eye splice reduces abrasive wear on the wire rope (fig. 1-8, view 2).

Hooks and Shackles

Hooks and shackles (fig. 1-9) provide a useful means of hauling the lifting loads without tying directly to the object with a line, wire rope, or chain. They can be attached to wire rope, fiber line, blocks, or chains. Shackles should be used for loads too heavy for hooks to handle.

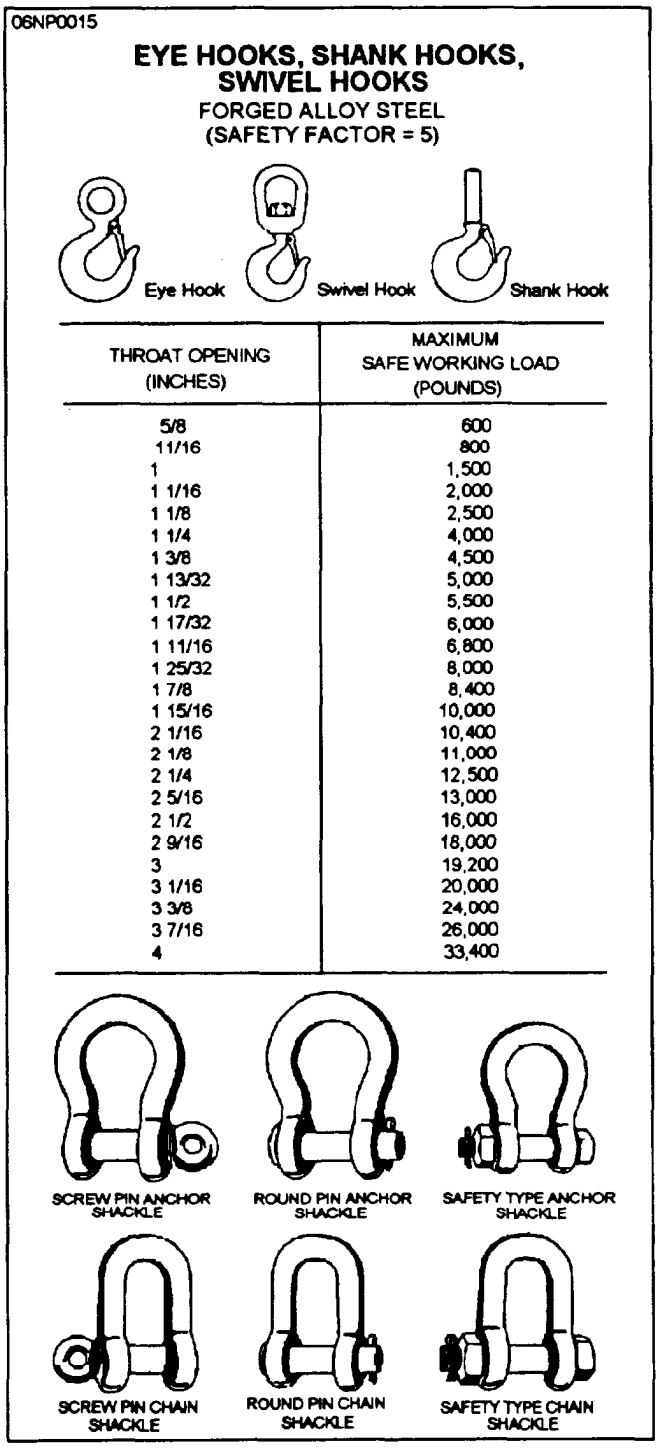
When hooks fail because of overloading, they usually straighten out and lose or drop their load. When a hook has been bent by overloading, do NOT straighten it and put it back into service.Cut it in half with a cutting torch and discard it.

Hooks should be given a visual inspection at the beginning of each workday and before lifting a full-rated load. If you are not sure whether a hook is strong enough to lift the load, use a shackle.

You should use hooks that close and lock where there is danger of catching on an obstruction. This applies particularly to hoisting buckets, or cages, and especially in shaft work. Hooks and rings used with chain should have about the same strength as the chain.

SLINGS

Slings are widely used in the moving and hoisting of heavy loads. You can obtain some types of slings already made up, but frequently you may have to make



THROAT OPENING (INCHES)	MAXIMUM SAFE WORKING LOAD (POUNDS)
5/8	600
11/16	800
1	1,500
1 1/16	2,000
1 1/8	2,500
1 1/4	4,000
1 3/8	4,500
1 13/32	5,000
1 1/2	5,500
1 17/32	6,000
1 11/16	6,800
1 25/32	8,000
1 7/8	8,400
1 15/16	10,000
2 1/16	10,400
2 1/8	11,000
2 1/4	12,500
2 5/16	13,000
2 1/2	16,000
2 9/16	18,000
3	19,200
3 1/16	20,000
3 3/8	24,000
3 7/16	26,000
4	33,400

Figure 1-9.—Hooks and shackles.

your own. Slings may be constructed of fiber line, wire rope, or chain.

Fiber-Line and Wire-Rope Slings

FIBER-LINE slings offer the advantage of flexibility and protection of finished material. At the same time, fiber-line slings are not as strong as wire-rope or chain slings. In addition, fiber-line slings are more likely to be damaged in the event of sharp edges on the material being hoisted than are wire-rope or chain slings.

Three types of fiber-line and wire-rope slings commonly used for lifting a load are the endless, single-leg, and bridle slings.

An ENDLESS SLING, usually referred to as a SLING, can be made by splicing together the ends of a piece of fiber line or wire rope to form an endless loop.

An endless sling is easy to handle, and you can use it in several different ways to lift loads. Frequently, it is used as a choker hitch (fig. 1-10). To form a choker hitch, cast the sling under the load to be lifted and insert one loop through the other and over the hoisting hook.

A SINGLE-LEG SLING, commonly referred to as a STRAP, can be constructed by forming a spliced eye in each end of a piece of fiber line or wire rope. Sometimes the ends of a piece of wire rope are spliced into eyes around thimbles, and one eye is fastened to a hook with a shackle. With this arrangement, the shackle and hook are removable.

A single-leg sling may be used as a choker hitch (fig. 1-11) in hoisting by passing one eye through the other eye and over the hoisting hook.

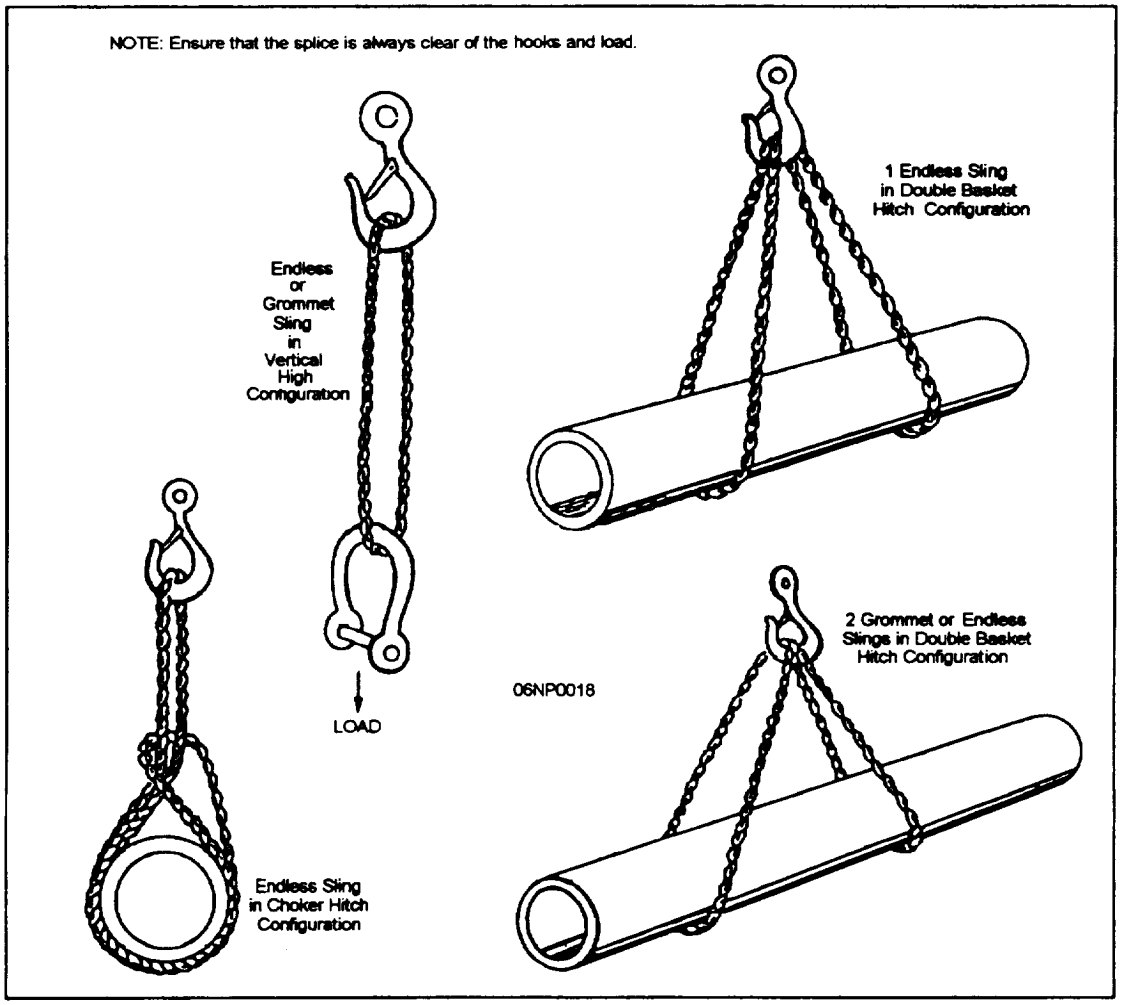


Figure 1-10.—Choker hitch formed from an endless sling.

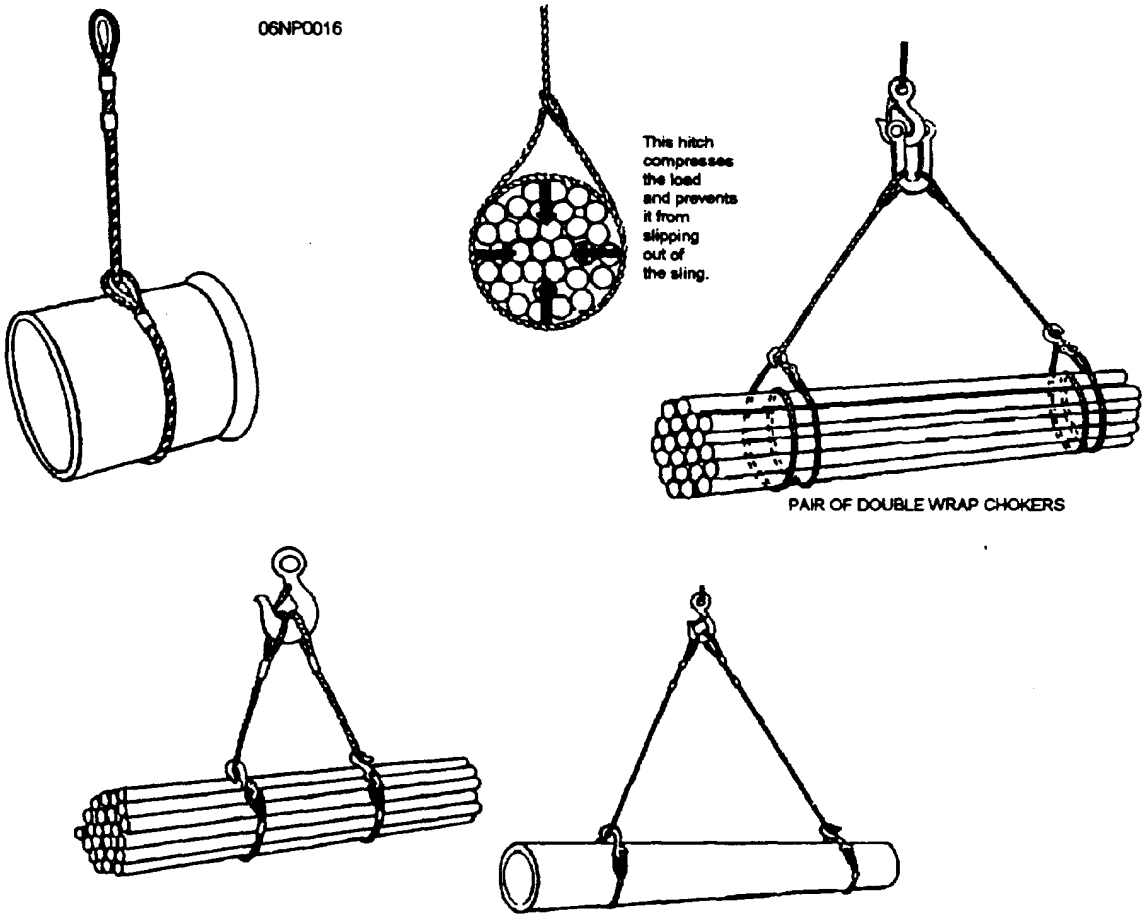


Figure 1-11.—Choker hitch formed by a single-leg sling.

You can use single-leg slings to make various types of BRIDLES. Two types are shown in figure 1-12. You can use two or more single slings for a given combination. Also, if an individual sling is not long enough for the job at hand, you can combine two of the single slings to form a longer single sling.

It is advantageous to have matched sets of slings (that is, two or more of equal length) so that when it is necessary to use more than one to hoist a load, the strain will be equal and the load will come up evenly. You should mark slings that are of equal length for ease of identification. Painting the eyes of equal-length slings the same color is one way of doing this.

In lifting heavy loads, always make a special effort to ensure that the bottoms of the sling legs are fastened to the load in a manner that will prevent damage to the load. Many pieces of equipment have eyes fastened to them during the process of manufacture to aid in lifting. With some loads, though, fastening a hook to the eye on one end of each sling leg provides an adequate means for securing the sling to the load.

Chafing gear (protective pads) must be used when a sling is exposed to sharp edges at the comers of a load. Pieces of round wood, heavy bagging, or old rubber tires are excellent materials to use as padding.

Chain Slings

Chain slings are frequently used in hoisting and moving heavy steel items, such as rails, pipes, wide-flange beams, and angles. They are also desirable for slinging hot loads and in handling loads with sharp edges that might cut wire rope.

Steel-length CHAIN SLINGS are available with variable type ends and lengths. Types include a 1/2-inch (12.7-mm) size sling, obtainable in either 12- or 20-foot (3.6-m or 6-m) lengths. This is a one-leg type of sling with a center swivel, equipped with a grab hook

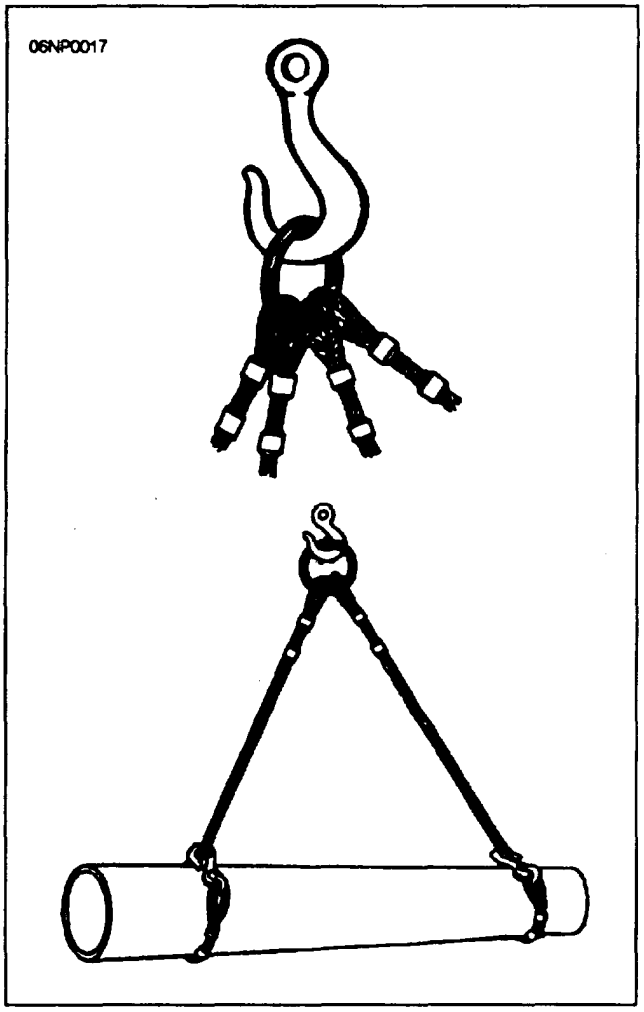


Figure 1-12.—Bridles.

on one end and a pelican hook on the other. There is also available a 3/4-inch (19.05-mm) chain sling, 22 feet (6.6 m) long, with a grab hook on one end and a Cinch (100-mm) link on the other.

Before doing any lifting with a chain sling, first place dunnage between the chain and the load to provide a gripping surface. In handling rails or a number of lengths of pipe, make a round turn and place the hook around the chain as shown in figure 1-13.

In using chain slings, you must exercise care to avoid twisting or kinking the chain while it is under stress. This condition might cause failure of the chain, even in handling a light load. Before lifting, make sure that the chain is free from twists and kinks. Make sure, also, that the load is properly seated in the hook (not on the point) and that the chain is free from nicks or other damage. Avoid sudden jerks in lifting or lowering the load, and always consider the angle of lift when using a sling chain bridle.

Store chains in a clean, dry place where they will not be exposed to the weather. Before storage, it is a good idea to apply a light coat of lubricant to prevent rust.

Makeshift repairs, such as fastening links of a chain together with bolts or wire, should never be permitted. When links become worn or damaged cut them out of the chain; then fasten the two adjacent links together with a connecting link. After the connecting link is closed and welded, it will be as strong as the other links. For cutting small-size chain links, use bolt cutters. For cutting large-size links, use a hacksaw or oxyacetylene torch.

Inspection of Slings

Slings must be inspected frequently and removed from service whenever defects are detected. Bear in mind that a defective sling may cause serious injury to personnel or extensive damage to equipment in case of failure under load.

You should check FIBER-LINE slings carefully for signs of deterioration caused by exposure to the weather. You should also check closely to determine whether any of the fibers have been broken or cut by sharp-edged objects.

Broken wires are a major defect to look for when inspecting WIRE-ROPE SLINGS. When four percent of the total number of wires in the rope are found to have nicks, or cuts, they should be replaced. However, if a chain shows evidence of stretching or distortion of more than five percent in any five-link section, make sure the entire chain is discarded.

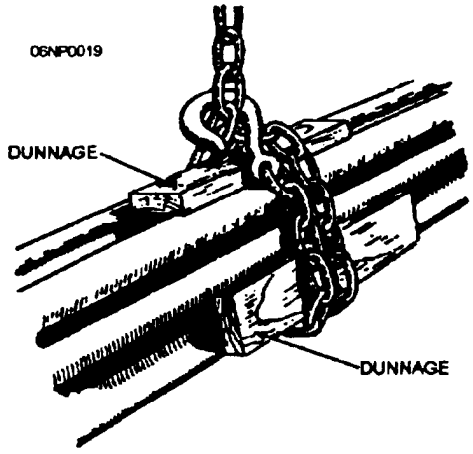


Figure 1-13.—Chain sling.

The least sign of binding at the juncture points of links indicates collapse in the sides of the link caused by stretching. Such a condition is dangerous, and the chain should be removed from service.

Spreaders and Pallets

When hoisting with slings, you may often need to use spreader bars to prevent crushing and damaging the load. Spreader bars are short bars or pipes that have eyes fastened to each end. By setting spreader bars in the sling legs above the top of the load (fig. 1-14), you change the angle of the sling leg and avoid crushing the load, particularly the upper portion.

The use of cargo PALLETS in combination with slings is a big advantage on jobs that involve the hoisting and moving of small-lot items (fig. 1-15). You may need to use spreader bars when hoisting pallets to avoid damaging the pallets and load. The pallet provides a small platform or board on which a number of items can be placed and moved as a unit rather than piece by piece. Palletizing obviously is quicker and easier than moving each individual item separately.

MOVING MATERIALS AND EQUIPMENT

The safe movement of equipment and materials does not just happen. It takes knowledgeable people to communicate, control, and rig movements. Personnel safety, undamaged materials/ equipment, and operational efficiency are the responsibility of all personnel involved.

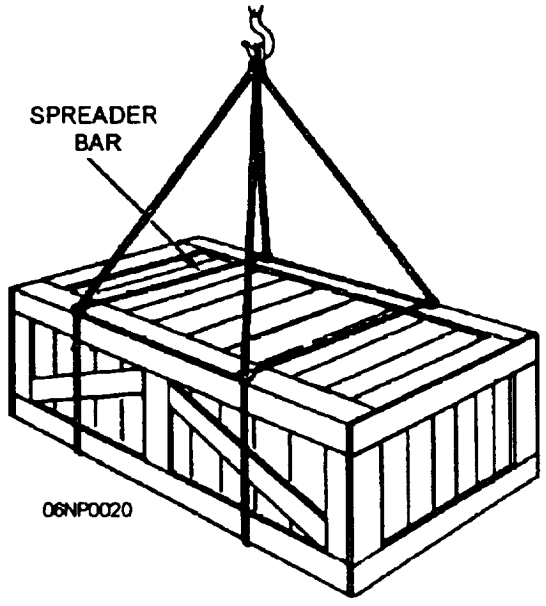


Figure 1-14.—Use of spreader bars in a sling.

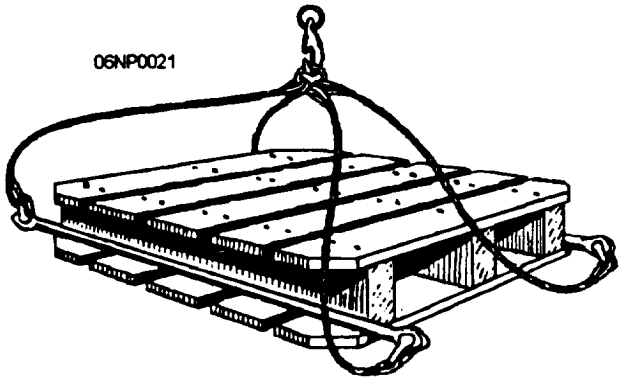


Figure 1-15.—Cargo pallets in combination with slings.

SIGNALLING

CEs are frequently required to act as signalmen for crane or hoist operators and for the positioning of equipment. There are a number of precautions and procedures that should be observed in these operations.

Whenever the operator's view is obstructed so that he cannot see the path of travel of any part of the equipment, load, or components, a competent signalman is required to be stationed in such a position that he or she can be easily seen by the operator and where the signalman has a full view of the intended path of travel of the equipment, load, or components, yet where he or she will be clear of the intended path of travel. The signalman should assist the operator by watching the load when it is out of view of the operator and communicating with the operator by the use of prearranged visual signals (app. III) or a suitable communication system.

The signalman must

- be fully qualified by experience with the operation.
- wear high-visibility gloves.
- use hand signals only when conditions are such that the signals are clearly visible to the operator.
- be made responsible for keeping the public and all unauthorized personnel outside the operating radius of the crane or the path of the equipment.
- direct the load so that it never passes over anyone.

When the signalman desires to give the operator any instructions other than those provided by the established signal system, the operator should be instructed to stop all motion FIRST.

Hand signals can be used effectively when the distance between the operator and the signalman is not great, but two-way radios should be used when the distance or atmospheric conditions prevent clear visibility. Adequate lighting and signalling arrangements must be available during night work, and the equipment must not be operated when either is inadequate.

PROCEDURES AND PRECAUTIONS FOR LIFTING OPERATIONS

The most important rigging precaution is to determine the weight of all loads before attempting to lift them, to make ample allowances for unknown factors, and to determine the available capacity of the equipment being used. In cases where the assessment of load weight is difficult, safe load indicators or weighing devices should be fitted. This chapter also includes a section dealing with the estimation of load weights.

It is equally important to rig the load so that it is stable. Unless the center of gravity of the load is below the hook, the load will shift.

The safety of personnel involved in rigging and hoisting operations largely depends upon care and common sense. Remember these safe practices.

- Know the safe working load of the equipment and tackle being used. Never exceed this limit.
- Determine the load weight before rigging it.
- Examine all hardware, equipment, tackle, and slings before using them and **survey** defective components. Discarded equipment may be used by someone not aware of the hazards or defects.
- Never can-y out any rigging or hoisting operation when the weather conditions are such that hazards to personnel, property, or the public are created. You must carefully examine the size and shape of the loads being lifted to determine if a hazard exists during high wind speeds. Avoid handling loads that have large wind-catching surfaces that could cause loss of control of the load during high or gusty winds. The wind can critically affect the loading and load-landing operation and the safety of the personnel involved (fig. 1-16).

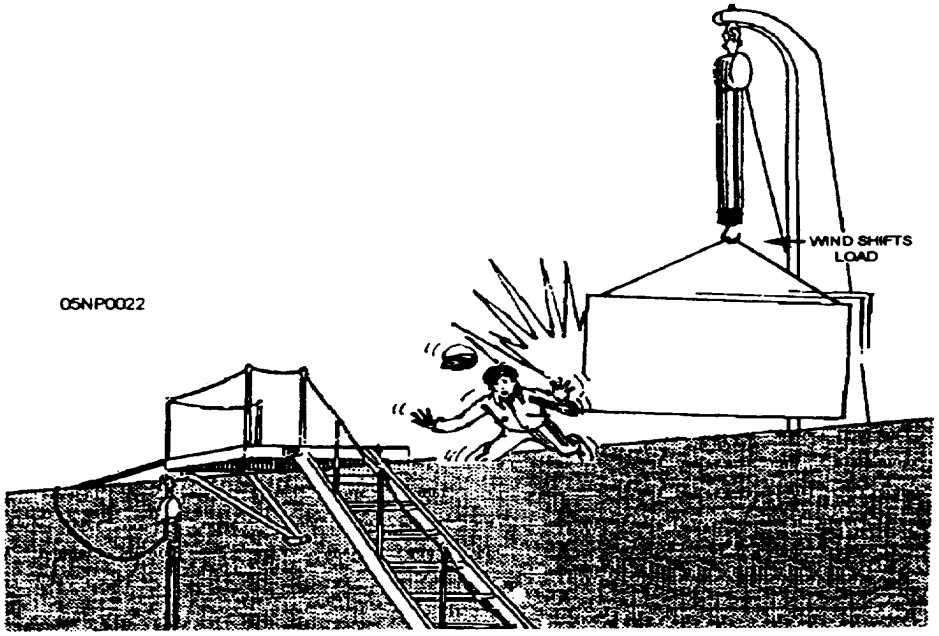


Figure 1-16.—Wind effects on load.

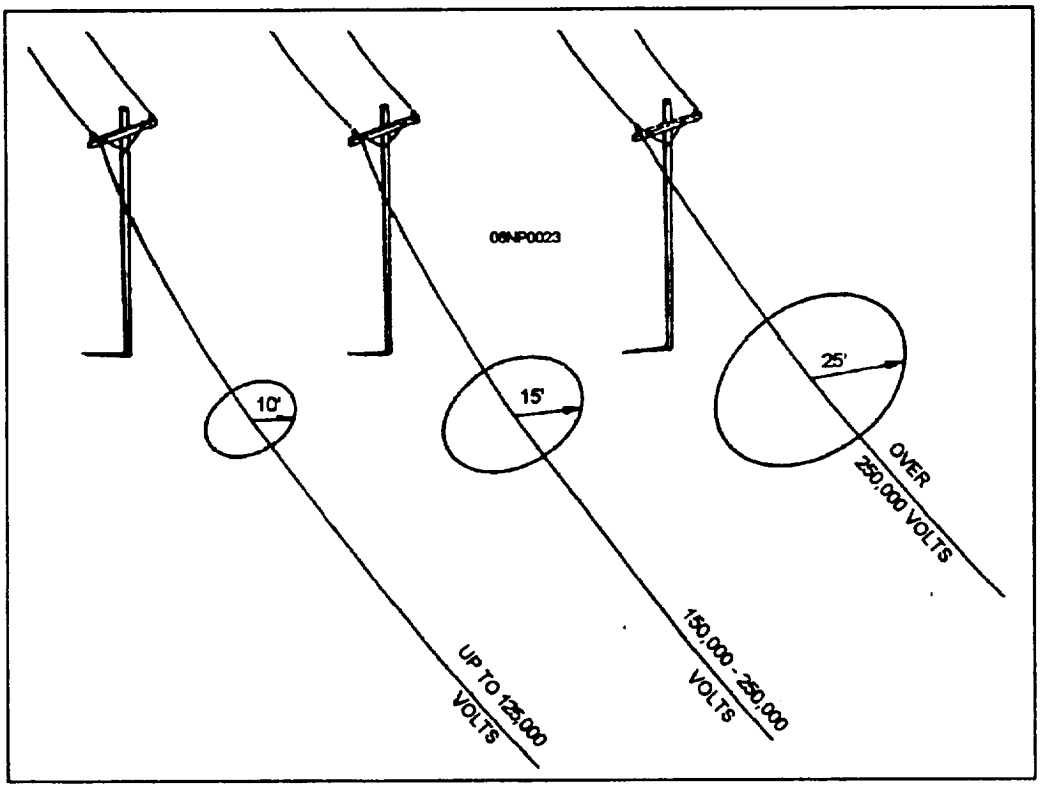


Figure 1-17.—Minimum safe distance for working around energized conductors.

• **The primary killer of riggers and those persons handling loads is electrocution caused by the contact of the boom, load line, or load of a crane with electric power lines.** When working with or around cranes that are within a boom's length of any power line, you must ensure that the power to that section of line is secured. If for some reason this cannot be accomplished, a competent signalman must be stationed at all times within view of the operator to warn him when any part of the machine or its load is approaching the minimum safe distance from the power line (fig. 1-17). You must also exercise caution when working near overhead lines that have long spans, as they tend to swing laterally because of the wind, and accidental contact could occur.

• The safe working loads of hoisting equipment apply only to freely suspended loads on plumb hoist lines. If the hoist line is not plumb at all times when handling loads, then additional side loads will endanger the stability of the equipment. In circumstances such as this, structural failures can result without any warning (fig. 1-18).

• Never use kinked or damaged slings or hoist wire ropes. To provide maximum operating efficiency and safety, you should give all slings and fittings thorough periodic inspections as well as daily inspections for signs of wear and abrasion, broken wires, worn or cracked fittings, loose seizing and splices, kinking, crushing, flattening, and corrosion. Special care should be taken in inspecting the areas around thimbles and fittings.

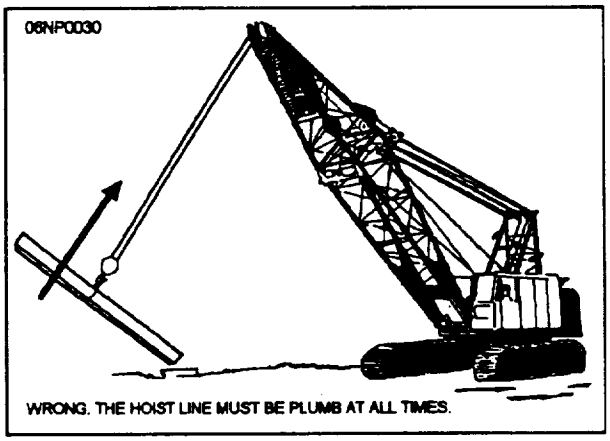


Figure 1-18.—Incorrect lifting procedures.

- When using choker hitches, do not force the eye down towards the load once tension is applied. Wire rope damage is the invariable result (fig. 1-19).

- Whenever two or more wire rope eyes must be placed over a hook, install a shackle on the hook with the shackle pin resting in the hook and hook the wire rope eyes to the shackle. This will prevent the spread of the sling legs from opening up the hook and also prevent the eyes from damaging each other when under load (fig. 1-20).

The following procedures and precautions should be observed whenever loads are to be handled:

- Rig all loads to prevent the dislodgement of any part Suspended loads should be securely slung and properly balanced before they are set in motion.

- Keep the load under control at all times. Where necessary by the rotation, use one or more guide wire ropes or tag lines to prevent the rotation or uncontrolled motion (fig. 1-21).

- Land all loads safely and block them properly before unhooking and unslinging them (fig. 1-22).

- Never wrap the hoist wire rope around the load Attach the load to the hook by slings or other rigging devices that are adequate for the load being lifted.

- Bring the load line over the center of gravity of load before starting the lift.

- Load and secure materials and equipment being hoisted to prevent any movement that could create a hazard in transit.

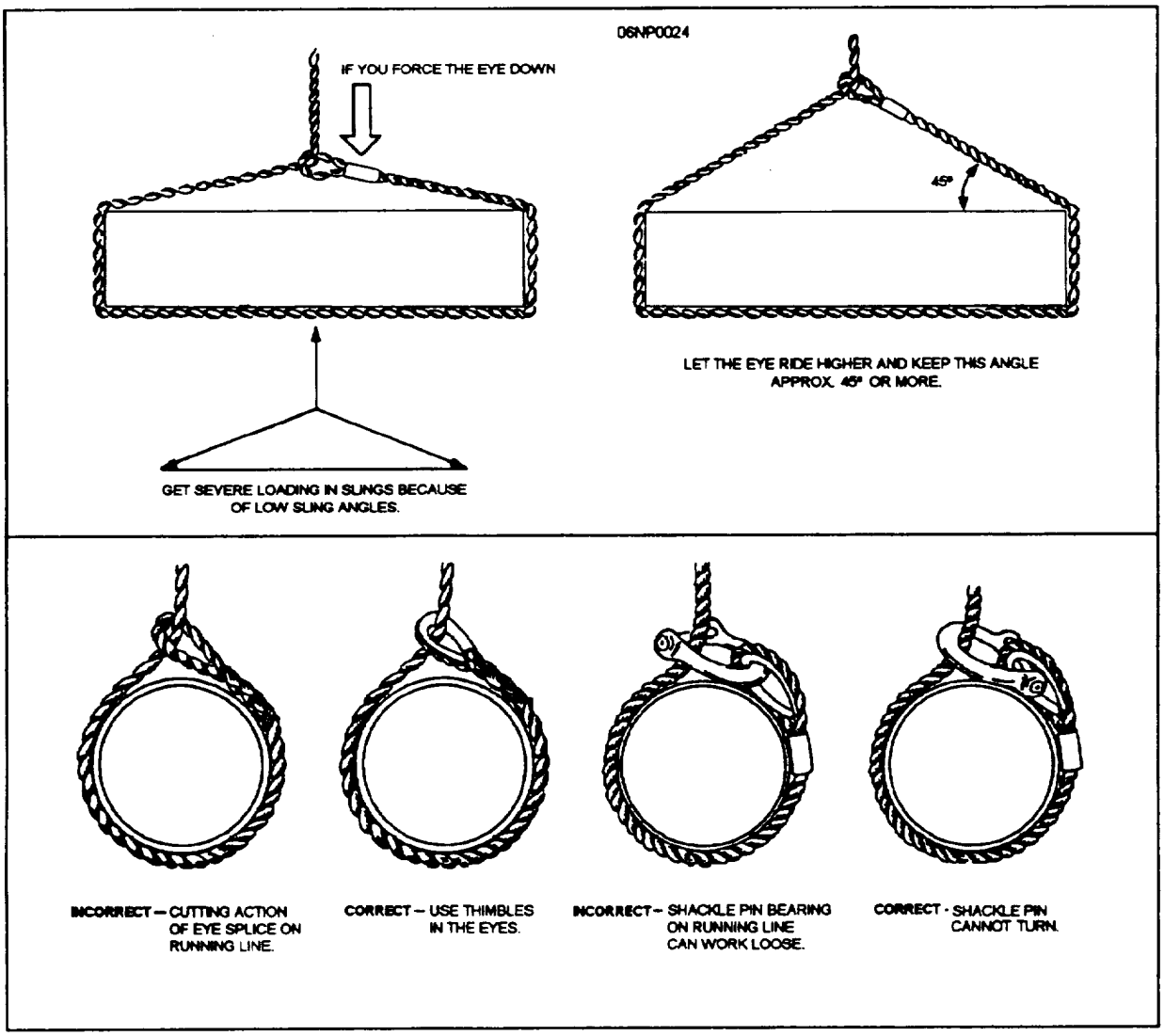


Figure 1-19.—Proper position of choker hitches for lifting.

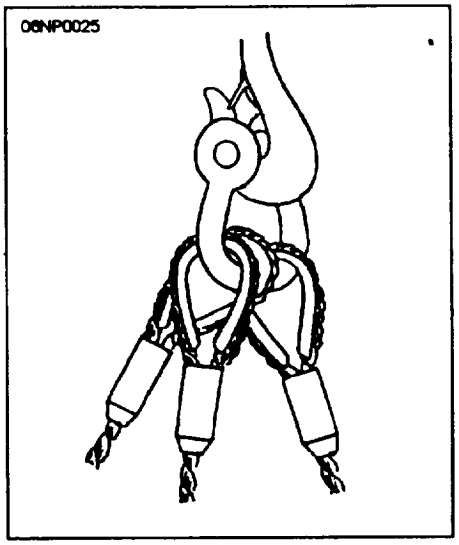


Figure 1-20.—Shackle use with two or more wire ropes.

- Keep hands away from pinch points as the slack is being taken up.

- Wear gloves when handling wire rope.

- Make sure that all personnel stand clear while loads are being lifted and lowered or while the slings are being drawn from beneath the load The hooks may catch under the load and suddenly fly free.

- Before making a lift, check to see that the sling is properly attached to the load

- Never, under any circumstances, ride on a load that is being lifted.

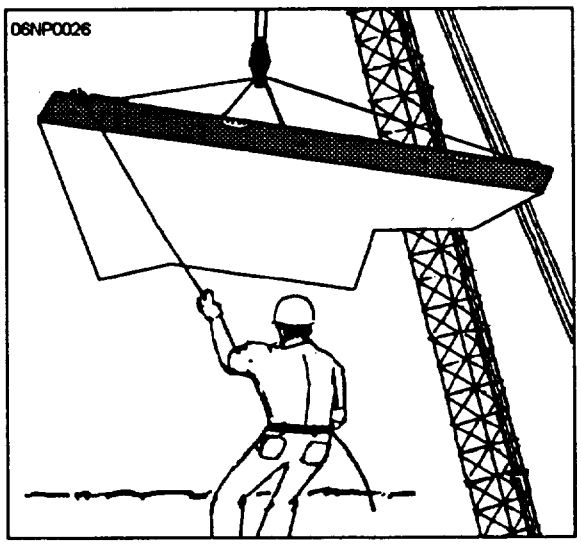


Figure 1-21.—Using tag lines to control load.

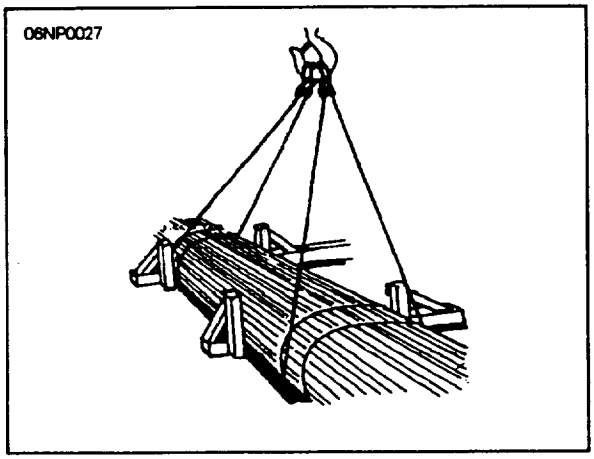


Figure 1-22.—Before loads are unhooked, they must be properly blocked.

- Never allow the load to be carried over the heads of any personnel.

- Never make temporary repairs to a sling. Procedures for proper repairs to a damaged sling should be established and followed

- Remove or secure all loose pieces of material from the load before it is moved.

- Make sure that the load is free before lifting and that all sling legs are taking the load.

HAZARDOUS MATERIAL

Read OPNAVINST 4110.2 dated 20 June 1989, subject: *Hazardous Material Control and Management* (HMC&M). This instruction establishes uniform policy, guidance, and requirements for the life-cycle control and total quality leadership (TQL) of hazardous material acquired and used by the Navy.

This instruction, unless otherwise specified applies to all Navy organizations and shore activities involved in the planning, procurement, acquisition, stowage, distribution, requisition, use, or other disposition of hazardous material (including disposal of used hazardous materials and hazardous wastes in the United States and its territories). Navy shore activity requirements in foreign countries are to comply with the requirements of host nation Status of Forces agreements if they are more restrictive than U.S. regulations. Where host national requirements are less stringent, conform to U.S. OSHA and EPA laws and regulations to the extent feasible.

The Department of Defense (DoD) established the Hazardous Material Information System (HMIS) to acquire, stow, and disseminate manufacturer's data on hazardous material (HM). The system provides a means to share and communicate information on HM procured by a single DoD activity with all other commands, activities, and units within DoD.

HAZARDOUS WASTE AND THE SEABEE

As you read the above paragraphs, you may have been inclined to think that the message and warnings could not possibly apply to you at your level. If this is what you thought, you were definitely wrong. It is true that the above instructions, along with a few others, give us the rules and regulations we must follow in regard to hazardous material, but they were also written for your protection. You, as a DoD employee, are ensured that the information on hazardous materials you may come in contact with will be available to you. This information is to be made available by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, Material Safety Data Sheets (MSDS), and training.

As a member of today's Navy, you must be aware of the importance of hazardous material, used hazardous material and hazardous waste. You also must recognize the hazards of hazardous material, used hazardous material and hazardous waste to personnel and the environment. You must pay particular attention to OPNAVINST 4110.2 and OPNAVINST 5100.23C on the use, stowage, and disposal of hazardous material in your workplace.

MATERIAL SAFETY DATA SHEETS (MSDS)

To comply with the OSHA Hazard Communication Standard, 29 CFR 1910.1200, manufacturers of chemical products must use an MSDS, OSHA Form 174, or an equivalent form containing the identical data elements to inform the users of the chemical, physical, and hazardous properties of their product. The completed form identifies key information about the product; name, address, and emergency contact for the manufacture; the identity of hazardous ingredients; physical/chemical characteristics; fire and explosion hazard data; reactivity data; health hazard data; precautions for safe handling and use; and control measures (fig. 1-23). All data submitted must comply with the provisions of FED-STD 313C (NOTAL).

You must be aware of any chemical hazards that are used in your work spaces or on the jobsite. An MSDS must be available in the workplace or posted conspicuously on all hazardous materials. The MSDS must be provided by the supply department and also by suppliers of any hazardous material issued or purchased. The MSDS must contain all the information you will need to work, stow, and dispose of hazardous material safely. In addition, the MSDS will identify any personnel protective clothing or equipment needed, as well as first aid or medical treatment required in case of exposure.

LABELED HAZARDOUS MATERIAL AND HAZARDOUS WASTE CONTAINERS

Each container of material possessing hazardous ingredients should be properly labeled by the manufacturer, importer, and or shipper(s) to warn personnel of the potential dangers of the material. In the event warning labels are inadvertently removed or damaged in shipping before receipt by shore activities, commercial suppliers should be required to provide OSHA Hazard Communication (HAZCOM) compliant replacement labels. Activities are not required to put DoD or other hazardous material warning labels on new stocks because the manufacturer is responsible for placing a warning label on it that conforms with the HAZCOM standard.

OSHA labeling requirements are provided in reference 29 CFR 1910.1200 for workplace use of hazardous material. This OSHA standard requires that containers of hazardous material be labeled, tagged, or marked with the identity of the hazardous chemical(s); appropriate hazard warnings; and the name and address of the chemical manufacturer, importer, or other responsible party. Further information on hazardous material labeling can be found in DODINST 6050.5.

HAZARDOUS MATERIAL LABEL

Labeling and marking of hazardous material containers is a function of the manufacturer, importer, or distributor. Your supply department should not accept improperly or incompletely labeled hazardous material. They should refuse to accept it and return it. However, if you need to relabel a container because the original label becomes damaged, unreadable, or is missing, use the DoD Hazardous Chemical Warning

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non - Mandatory Form)
Form Approved
OMB No. 1218 - 0072

IDENTITY *(As Used on Label and List)*

Note : Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name	Emergency Telephone Number
Address *(Number, Street, City, State, and Zip Code)*	Telephone Number for Information
	Date Prepared
	Signature of Preparer *(Optional)*

Section II — Hazardous Ingredients / Identity Information

Hazardous Components (Specific Chemical Identity ; Common Name(s)	OSHA PEL	ACGIH TLV	Other Limits Recommended	% *(Optional)*

Section III — Physical / Chemical Characteristics

Boiling Point		Specific Gravity ($H_2O = 1$)	
Vapor Pressure (mm Hg)		Melting Point	
Vapor Density (Air = 1)		Evaporation Rate (Butyl Acetate = 1)	

Solubility in Water

Appearance and Color

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL

Extinguishing Media

Special Fire Fighting Procedures

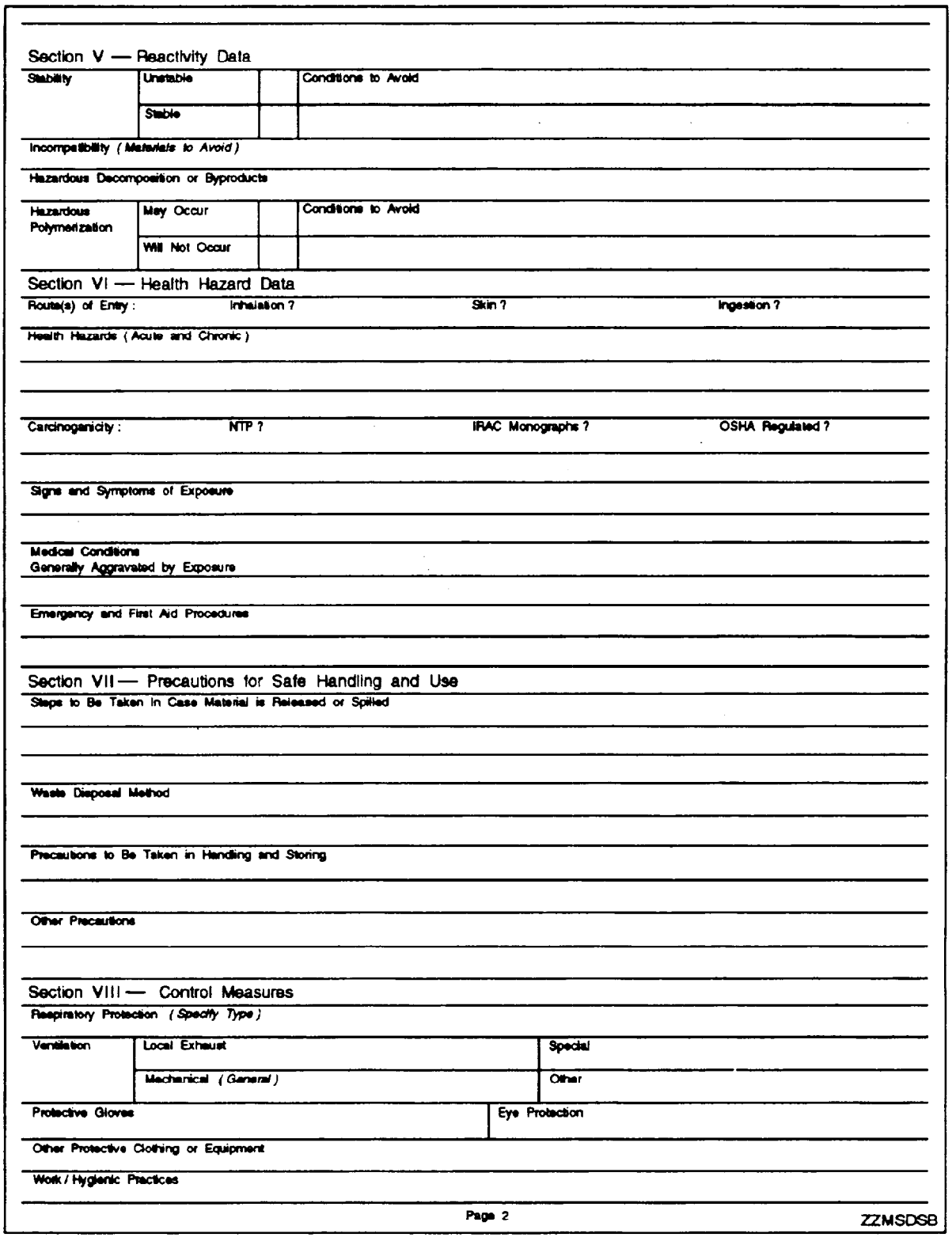
Unusual Fire and Explosion Hazards

(Reproduce Locally)

OSHA 174 , Sept. 1985

ZZMSDSF

Figure 1-23A.—Material Safety Data Sheet (front).



Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable		

Incompatibility (Materials to Avoid)

Hazardous Decomposition or Byproducts

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation ? Skin ? Ingestion ?

Health Hazards (Acute and Chronic)

Carcinogenicity: NTP ? IRAC Monographs ? OSHA Regulated ?

Signs and Symptoms of Exposure

Medical Conditions
Generally Aggravated by Exposure

Emergency and First Aid Procedures

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken In Case Material is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storing

Other Precautions

Section VIII — Control Measures

Respiratory Protection (Specify Type)

Ventilation	Local Exhaust	Special
	Mechanical (General)	Other

Protective Gloves	Eye Protection

Other Protective Clothing or Equipment

Work / Hygienic Practices

Page 2

ZZMSDSB

Figure 1-23B.—Material Safety Data Sheet (back).

Label in figure 1-24. These are the only approved labels to be used to identify hazardous material (according to DODINST 6050.5) and can be filled in using the DoD HMIS CD-ROM.

EMBARKATION

The movement of equipment/material done at a battalion level will involve personnel throughout the command. While Alpha company has the bulk of the

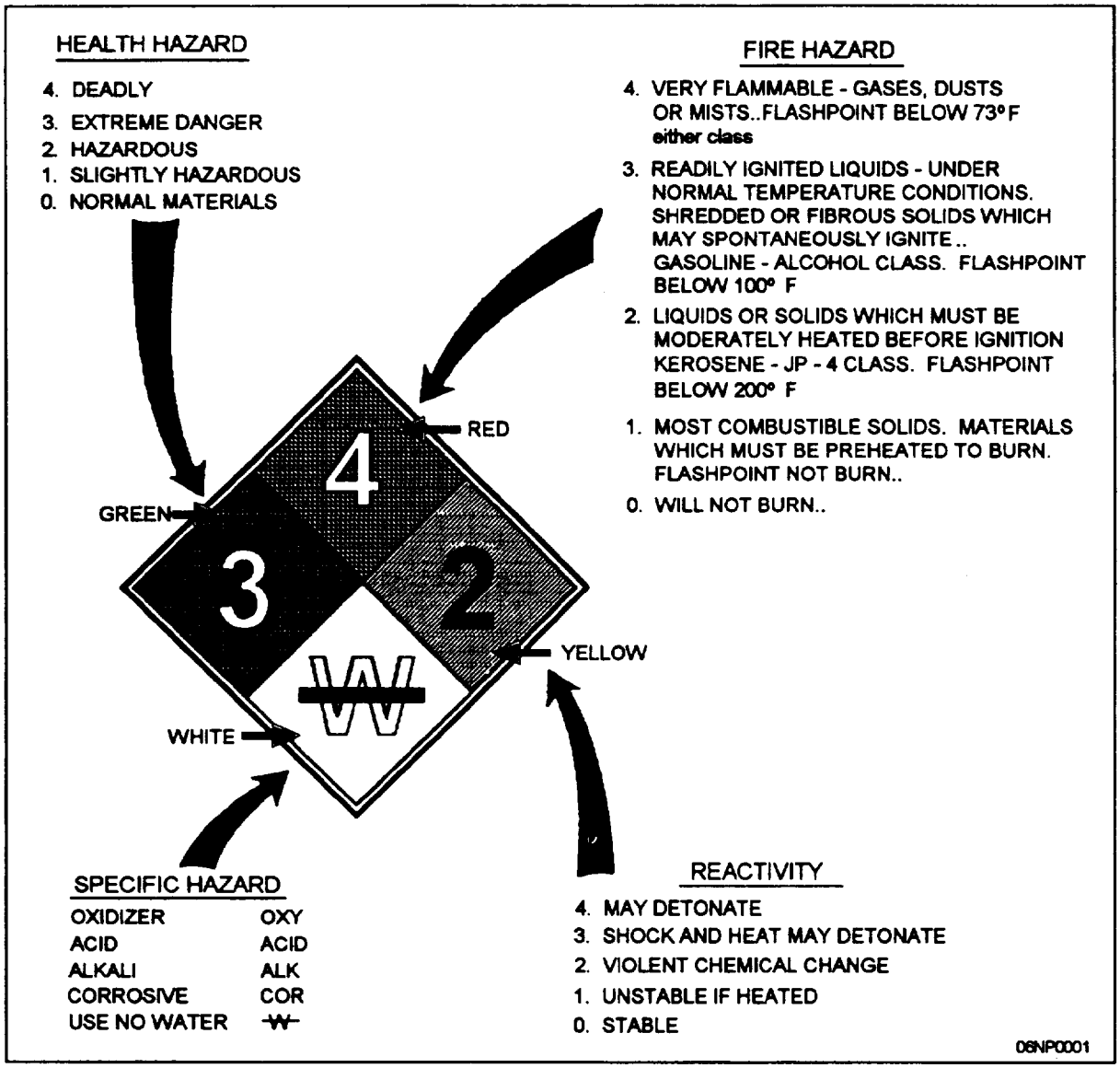


Figure 1-24.—Hazardous chemical warning label.

responsibility, you, as a CE, can and will become involved.

AIR DETACHMENT

The Air Detachment (Air Det), as stated in U.S. *Naval Mobile Construction Battalion (NMCB) Doctrine and Policy Governing,* OPNAVINST 5450.46, is part of a Naval Mobile Construction Battalion (NMCB) organization and is capable of deploying within 48 hours of notification. The mission of the Air Det is to provide contingency support for the Navy, Marine Corps, and other forces, and perform and participate in disaster recovery operations and field exercises (FEX). The Air Det has approximately 90 personnel assigned and contains air-liftable supplies, tools, and Civil Engineer Support Equipment (CESE) to perform both horizontal and vertical construction. The Air Det is self-sufficient for 30 days (600 construction hours), except for ammunition, rations, and fuel. The Air Det can operate independently of an NMCB for an indefinite period when provided logistic support.

Personnel are assigned to the Air Det by the Battalion Operations Department using the basic

guidelines provided in the *NCF Embarkation Manual,* COMCBPAC/COMCBLANTINST 3120.1. The ratings and number of personnel assigned to the Air Det are governed by the tasking of the mission.

The Air Det is organized into three platoons: an equipment platoon, a support platoon, and a construction platoon. The equipment platoon supervisor organizes the platoon into a military formation and assigns military and job-related responsibilities.

TABLE OF ALLOWANCE (TOA)

The Table of Allowance (TOA) outfits the Naval Mobile Construction Battalion with the capability to perform construction operations under contingency conditions for 90 days (1800 construction hours) without resupply. However, fuel and subsistence are limited to 15 days support, and construction materials that support construction operations are not part of the TOA. The area commander/project sponsor requiring the use of Seabees is responsible for the procurement and shipment of construction materials.

The Civil Engineer Support Office (CESO), Port Hueneme, California, is the system manager responsible for maintaining NCF TOAs. CESO develops new allowances as directed by COMNAVFACENGCOM and collects field recommendations for revisions to existing TOAs. The TOA represents the best selection of tools and supplies needed to provide general construction capabilities; however, the TOA is not capable of meeting every conceivable operational requirement. When an assigned project requires tools or equipment in excess of the unit's capability, the allowance is supplemented by augmentation.

CESE REQUIREMENTS

The amount of CESE and supplies required for a mission is controlled by the availability of airlift, sealift, or over-the-road support. This requires the Air Det to preplan and prioritize all tasking and request only the amount of resources needed to accomplish the mission successfully. The knowledge and expertise of the equipment platoon supervisor enhances the Air Det's ability to identify and request the required CESE, supplies, and POL for the Air Det mission. This allows the embarkation office to prepare aircraft load plans to meet the Air Det's needs.

OPERATOR ASSIGNMENTS

Once the CESE list has been established, the equipment platoon supervisor must assign operators and co-drivers. Operators are required to accompany the CESE throughout the transport to the mission site and also must stand by their assigned CESE that has been prepared and staged at the marshalling area for the joint inspection (JI). The staging and marshalling area is where equipment and materials are received. CESE is inspected for cleanliness and fluid leaks, mobile loads are completed, vehicles are weighed and marked for center of balance, cargo is palletized on the Air Force 463L cargo pallets (fig. 1-25), and cargo and CESE are placed into a configuration for each aircraft A pre-JI is held and performed by the battalion embarkation officer and the regiment embarkation staff from Port Hueneme, California, or Gulfport, Mississippi, during the home-port period. When the battalion is deployed overseas, COMCBPAC/COMCBLANT embarkation representatives perform the pre-JI. The pre-JI allows the battalion time to correct any discrepancies before the main JI.

CESE AND MATERIAL PREPARATION

Upon notification of the Air Det to mount-out. the battalion reorganizes and sets up a mount-out control center (MOCC). The MOCC is under the direction of the battalion executive officer. The MOCC controls, coordinates, and monitors the movement of all personnel, supplies, and equipment to the marshalling area. The MOCC and the embarkation staff control all aspects of an NMCB mount-out and serves as the coordinating center for all the companies and battalion staff.

PALLETIZED CARGO

The 463L pallet is the Air Force standard equipment for the movement of concentrated cargo. Military aircraft installed with a dual-rail system that consists of rows of rollers allow the 463L pallets loaded with cargo to move easily into the aircraft. The 463L pallet is made of corrosion-resistant aluminum and has a softwood core. The pallet has an outside dimension of 108 inches by 88 inches and is 2 1/4 inches thick. The cargo area space is 104 inches by 84 inches, which allows for 2 inches around the pallet to attach straps, nets, or other restraint devices. The pallet weighs 290 pounds empty and has a maximum load capacity of 10,000 pounds.

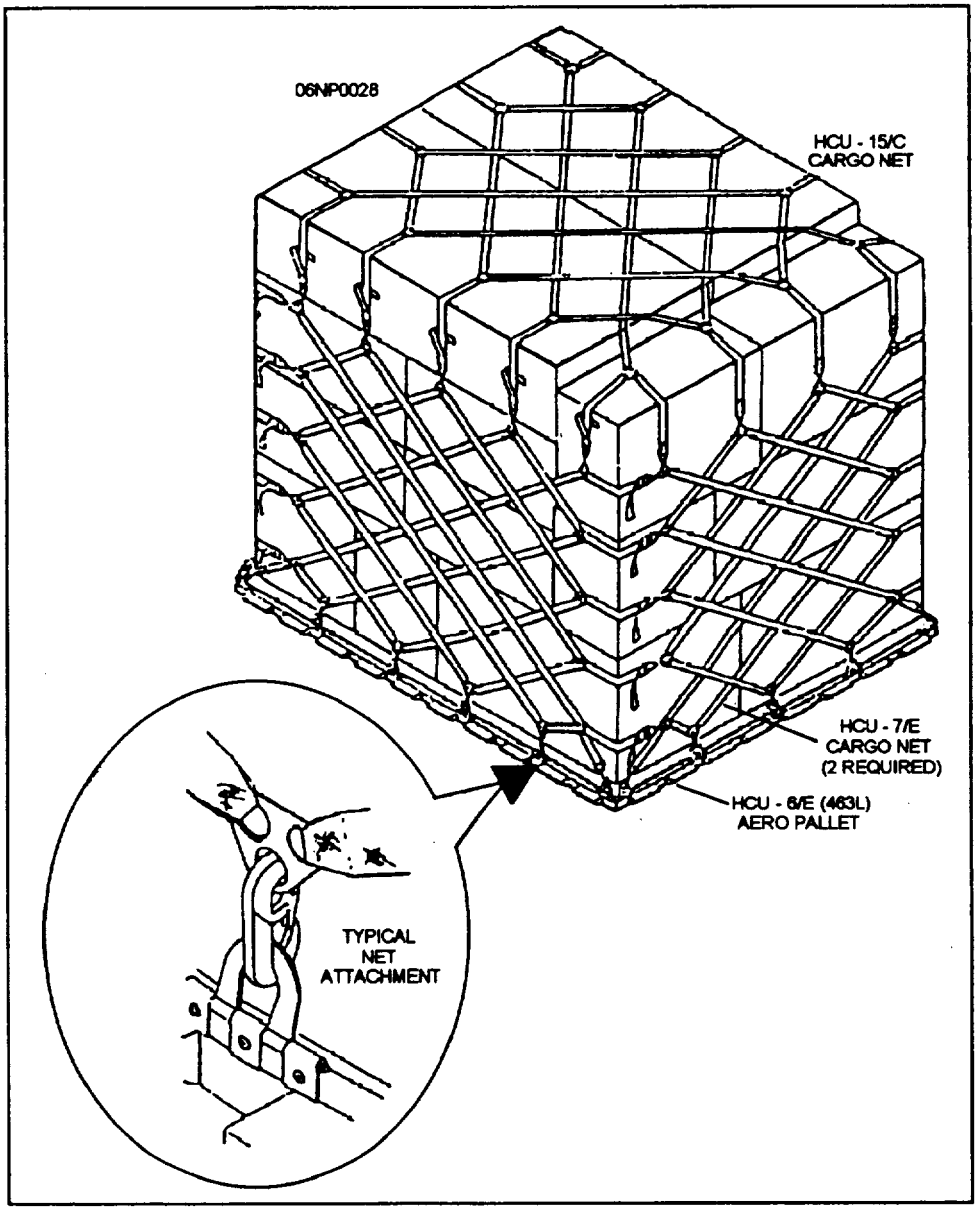


Figure 1-25.—463L pallet with cargo and net.

PROJECTS

The primary purpose of the construction platoon is to perform construction operations for the Air Det with the support of the equipment and support platoons. Construction tasking covers a broad scope of activities: disaster recovery operations, war damage repairs, rapid runway repairs, humanitarian relief, constructing advance base functional components, and so forth. The assignment of ratings assigned to the Air Det depends on the extent of tasking, such as horizontal or vertical construction. The amount of time allotted to plan construction projects depends on the urgency for the Air Det to embark to the mission site.

TOOL KITS

Some tool kits are groups of tools assembled for specific purposes, like bending conduit or pulling wire or cable. Other kits include tools for general electrical construction work. The kits for general work include toolboxes. Enough toolboxes are supplied in the kit for one crew of Construction Electricians.

The Civil Engineer Support Office (CESO) determines the contents of the kits. CESO is located at the Construction Battalion Center (CBC), Port Hueneme, California. Kit contents may change as new tools become available and as the need for a particular assembly is pointed out to CESO by Construction Electricians in the field

TOOL KIT INVENTORIES

The requirements associated with tool kit accountability sometimes vary from one activity to another. You are responsible for tools checked out to you from the central toolroom (CTR). Tools are not only expensive but are essential equipment for those who use them in constructing a quality project. The proper tools must be available when and where they are needed. The only way to be certain the right tools are available when needed is to keep track of them at all times.

Kits from CTR should be maintained at 100 percent of kit assembly allowance. Damaged and worn tools should be returned to CTR for replacement in kind. Tools requiring routine maintenance, such as power tools, should be turned in for repair and reissue. You will be required to submit NAVSUP Form 1250-1s (fig. 1-26) signed by a designated officer for tools and/or consumables needed to replace consumed, lost, or missing items in the kits. Normally, these NAVSUP Forms 1250-1s will be attached to the biweekly inventory sheets (fig. 1-27). EXCESSIVE SHORTAGES BETWEEN INVENTORIES ARE TO BE INVESTIGATED.

TOOL STOWAGE AND SECURITY

The crew leader must plan ahead for tool stowage and security. When there is no secure place to stow tools at the jobsite, you may need to make arrangements to haul them back to the camp each day. “Gang” boxes are sometimes used to secure all the tools of a crew at a jobsite. These are large lockable boxes constructed of wood or steel and are sometimes equipped with wheels. Even though these boxes may have sloped roofs and be waterproofed, they should be placed on high ground in case of local flooding. Once you have considered storage and security of tools, you need to decide how to keep up with them through the workday.

You are responsible for the security and safe operation of your tools. Crew members may want to carry their toolboxes to the jobsite or leave them in the gang box or secure area. Toolboxes are best kept locked. Tools used daily may be kept in a pouch. For safety and tool-security reasons, you should be especially careful not to leave small hand tools lying around.

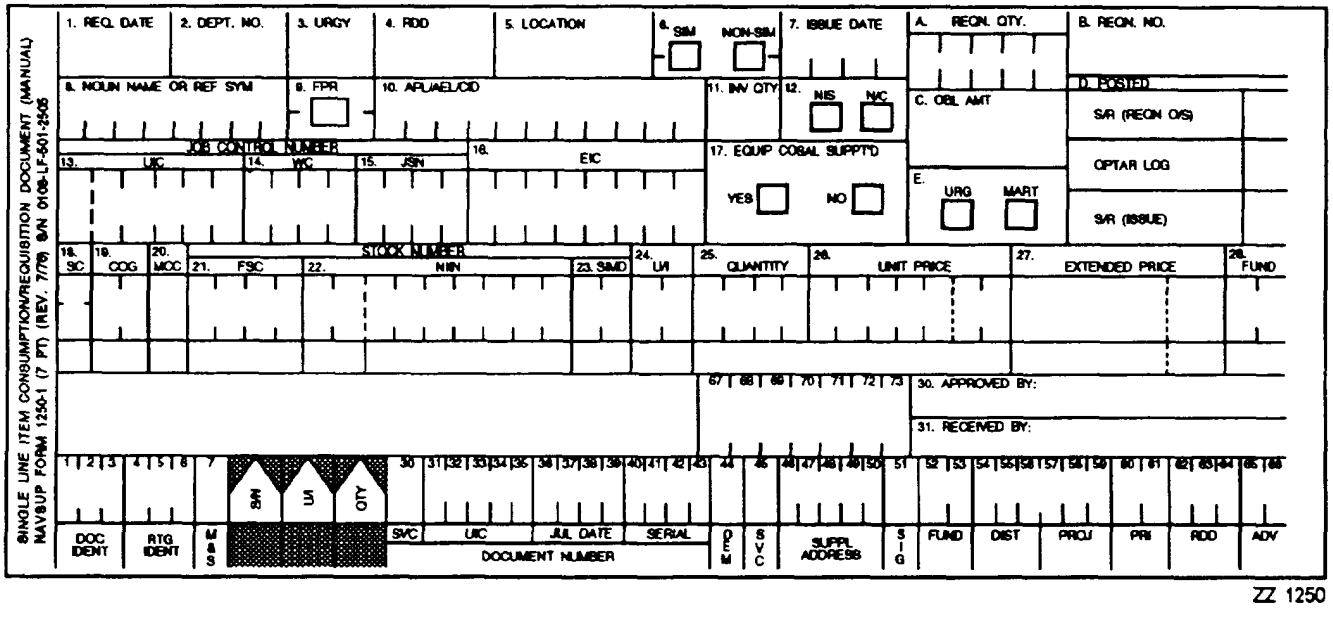


Figure 1-26.—Single-Line Item Consumption Document (Manual), NAVSUP Form 1250-1.

FACSO RPT SYM/NO. 04440/B356IRQ1 I N V E N T O R Y M A N A G E M E N T S Y S T E M 06NP0029 89JUN06

42 PROJECT NO. AEG94 KIT INVENTORY LIST TA31 PAGE 211

80007 SEQ. NO. G SEQUENCE = KIT, SEQ. NO. ALPHA

COG	STOCK NUMBER	QTY	UI	UNIT PRICE	EXT. PRICE	(JULIAN DATE OF INVENTORY/ NAVSUP FORM 1250 DEPT NO AND QUANTITY SHORT) (J/D DEPT#(QTY)) (J/D DEPT#(QTY)) (J/D DEPT#(QTY)) (J/D DEPT#(QTY)) (J/D DEPT#(QTY)) (J/D DEPT#(QTY)) (J/D DEPT#(QTY))
9G	4240-01-100-9016	2	EA	23.96	47.92	
	STRAP SAFETY IMPREGNATED NYLON W/NEOPRENE 1 3/4 X 72 KLEIN-KORD P/N 5295-6 W/STD SNAPS					
9Q	4240-00-844-8035	2	PR	5.42	10.84	
	STRAP SET CALF F/CLIMBERS TREE AND POLE,USE W/NSN 4240-01-158-0553 AND 4240-00-893-3326					
9G	5970-00-419-4291	2	RO	.91	1.82	
	TAPE ELEC 0.75NX108FT (BLK) PLSTC					
9Q	5210-00-926-1772	1	EA	12.46	12.46	
	TAPE MEASURE CHROME CLAD 100FT LONG W/HAND CRANK, GRADUATED IN FEET,INCHES AND 8THS OF AN INCH					
9Q	5120-00-277-4248,	2	EA	16.00	32.00	
	WRENCH LINEMAN DBL					
9Q	5120-00-264-3796	2	EA	8.33	16.66	
	WRENCH OE ADJ 12N					
9Q	5120-00-240-5328	2	EA	5.77	11.81	
	WRENCH OE ADJ 8N					
9Q	5120-00-935-7340	1	SE	17.41	17.41	
	WRENCH SET HEX KEY T HANDLE 10PCS 3/32 THRU 3/8N					
	KIT 80007 TOTAL			1,683.01		

SUBTOTAL, SUPPLEMENTAL SHEET SHORTAGES THIS PERIOD ( ) ( ) ( ) ( ) ( ) ( ) ( )
SUBTOTAL, DOLLAR VALUE OF SHORTAGES THIS PERIOD ( ) ( ) ( ) ( ) ( ) ( ) ( )
CUMULATIVE SHORTAGES TO DATE, THIS CUSTODIAN (8FS) ( ) ( ) ( ) ( ) ( ) ( )

I ACKNOWLEDGE CUSTODY AND PERSONAL ACCOUNTABILITY FOR THE MATERIAL IN THIS KIT. (CUSTODIAN . DEPT/CO DATE)

Figure 1-27.—Tool kit inventory list.